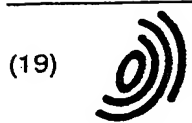


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Remarks:

This application was filed on 22 - 02 - 2000 as a
divisional application to the application mentioned
under INID code 62.

(54) Retractor spool

(57) A seat belt retractor comprising a spool
mounted on a spool shaft for rotation in the retractor,
wherein the force limiting means comprises resilient
biasing means acting between the spool and the spool
shaft.

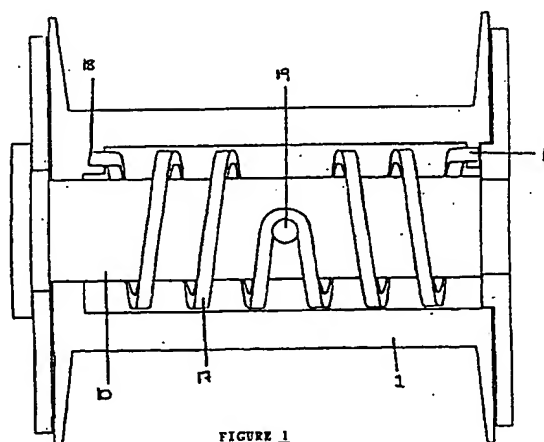


FIGURE 1

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Description

[0001] The present invention relates to a retractor spool for a vehicle safety restraint.

[0002] This application is divided from EP-A-97 901 189.7 and is related to copending divisional application no.

[0003] A retractor spool generally consists of a cylindrical bobbin with a circular cross-section. Seat belt webbing is attached to and wound around the spool and the spool is mounted on a spool shaft to be rotatable in the retractor to wind in webbing under action of a retractor spring and to pay out webbing under the influence of relatively gentle forwardly directed inertia of a vehicle occupant, for example to allow for normal movement associated with vehicle occupancy such as reaching forwards to activate in-car controls (for a radio or a window) or to reach a glove compartment or door pocket. In the event of a crash situation, the more extreme momentum of the occupant activates a crash sensor which locks the spool against rotation and thus prevents forward motion of the occupant and injury due to occupant collision with the interior fixtures of the vehicle such as the steering wheel, dashboard or windscreen.

[0004] However, this sudden locking of the seat belt spool under crash conditions can itself sometimes cause injury to the occupant due to sudden impact of the torso with the belt webbing. This is particularly true in high velocity crashes.

[0005] In recent years this problem has been recognised and some solutions proposed.

[0006] One solution has been to rely on natural elongation of the webbing under high loads, and on the spool film effect (natural tightening of the webbing wound on the spool under high loads), to produce a load limiting effect.

[0007] Another known proposal has been described in EP 0 297 537 A, wherein force limiting is effected by interposing a plastically deformable member between the spool and the innermost winding of the belt webbing or by interposing an elastic member such as a spring rubber member or resin member between an end flange of the spool and the latch plate. This allows a pay-out of webbing in proportion to the inertia of the vehicle occupant at the moment of a crash condition being sensed. This pay-out lessens the otherwise severe restraining forces on the occupant at high vehicle speeds especially during the initial moments of the crash. It thus reduces the injurious effects of the seat belt in a crash.

[0008] The present invention proposed improved load limiting arrangements for retractors.

[0009] According to one aspect of the present invention there is provided a seat belt retractor comprising a spool mounted on a spool shaft for rotation in the retractor, wherein the force limiting means comprises resilient biasing means acting between the spool and the spool shaft.

[0010] According to the present invention the force

limiting means comprises resilient biasing means acting between the spool and its axis of rotation, for example a coiled tension spring wound around a spool shaft coaxial with the spool, or a clock spring or springs operating in a similar manner to a normal retractor spring.

[0011] In such an arrangement there will be an initial preset torque in the spring which determines the minimum load at which limiting starts to occur. As the load increases beyond this minimum, the spring is wound up tight and the diameter of its centre bore decreases. A maximum force limitation occurs when the spring is wound tightly about the spool shaft.

[0012] Alternatively this arrangement could be used with a spring mechanism the centre bore size of which increases with increasing load up to a maximum determined by the size of the internal bore of the spool.

[0013] This invention is particularly advantageous because the force limiting means is re-usable and is automatically reset after crash conditions have abated. After impact the restrained occupant rebounds off the belt into his seat. The taut spring then uncoils, rewinding slack in the belt webbing and satisfactorily restraining the occupant in the event of a second impact.

[0014] For a better understanding and to show how the same may be carried into effect, reference will now be made to the accompanying drawing in which the single figure:

Figure 1 is a cross-sectional view of a retractor according to the invention;

Like parts are denoted by like reference numerals throughout.

[0015] In Figure 1 a torsion spring 17 is coiled around the spool shaft 10 within the hollow of spool 1. It is fixed at its ends 18 to the spool and at its middle to shaft 10 by pin or bolt 19.

[0016] In a crash impact the forward momentum of the occupant being restrained acts on the spool 1 to try to pay out more belt webbing. Since the shaft 10 is locked by a locking mechanism, activated by a crash sensor, then the relative rotation of the spool to the shaft tightens the spring 17 as more webbing is paid out, until the spring is coiled tightly around the shaft at which point pay-out ceases since the spool 1 is locked to the locked shaft 10.

[0017] When webbing tension is released as the crash conditions abate, the spring acts to rotate the spool in a rewinding direction thus drawing in the extra payed-out webbing together with any slack (which may have been caused by webbing stretch or by cinching of webbing on the spool). Thus the occupant is well protected against a second impact.

[0018] If the spring 17 is wound the opposite way then, as webbing is paid out in a load limiting operation, the spring will expand until it fills the spool 1, which defines therefore the maximum force at which load limiting operates. The spring will draw in webbing as it sub-

sequently recoils itself.

Claims

1. A seat belt retractor comprising a spool mounted on a spool shaft for rotation in the retractor, wherein the force limiting means comprises resilient biasing means acting between the spool and the spool shaft. 5
2. A seat belt retractor according to claim 1 wherein the force limiting means comprises a coiled tension spring wound around a spool shaft coaxial with the spool. 10
3. A seat belt retractor according to claim 2 wherein the force limiting means comprises a clock spring or springs operating in a similar manner to a normal retractor spring. 15

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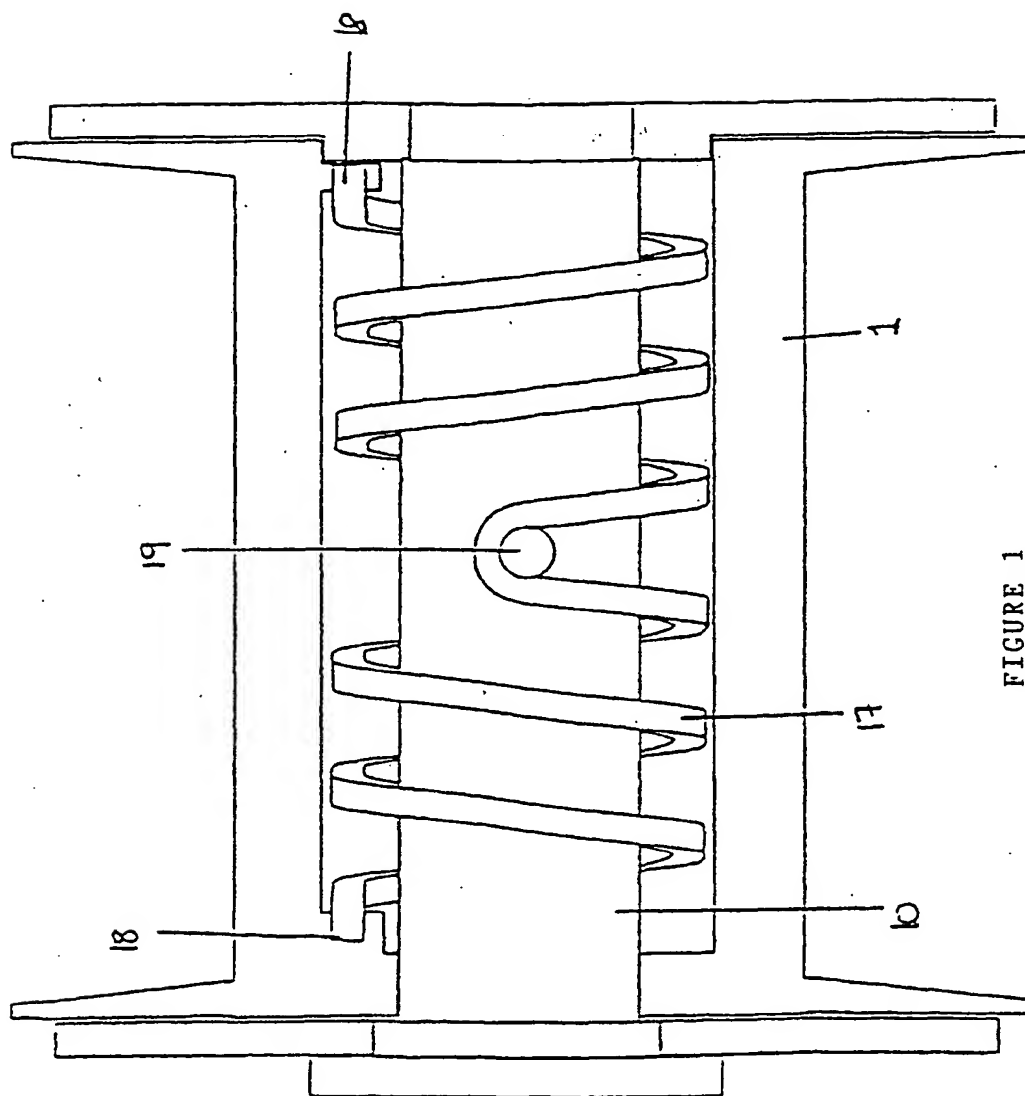
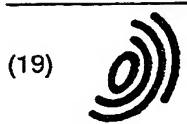


FIGURE 1



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(74) Representative:
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(54) Retractor spool

(57) A seat belt retractor comprising a spool (1) mounted on a spool shaft (10) for rotation in the retractor, wherein the force limiting means comprises resilient

biasing means (17) acting between the spool (1) and the spool shaft (10).

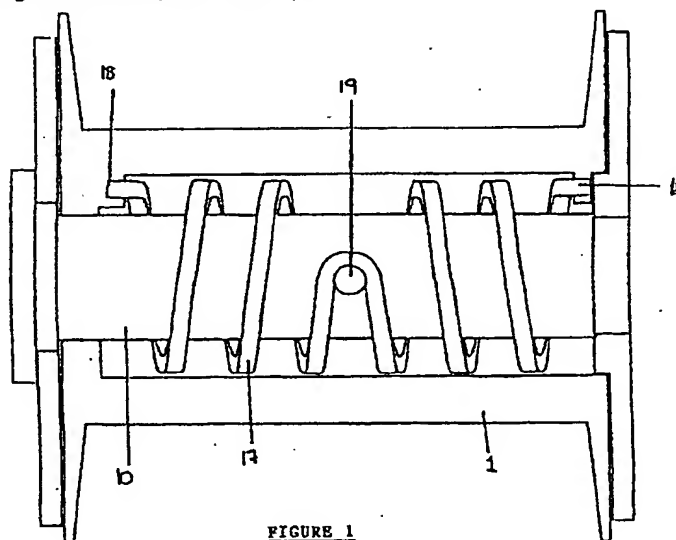


FIGURE 1

EP 1 024 064 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 3357

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|--|---|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (In I.C.I.7) |
| X | US 3 970 265 A (KOPKE WILFRIED ET AL) 20 July 1976 (1976-07-20) * column 3, line 26 - line 38 * ----- | 1 | B60R22/34 |
| | | | TECHNICAL FIELDS SEARCHED (Int.Cl.7) |
| | | | B60R |
| The present search report has been drawn up for all claims | | | |
| Place of search BERLIN | | Date of completion of the search 7 June 2000 | Examiner Standring, M |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p> | | | |

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ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 10 3357

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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07-06-2000

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